

# TIRCIS: A Thermal Infrared, Compact Imaging Spectrometer for Small Satellite Applications (TIRCIS)

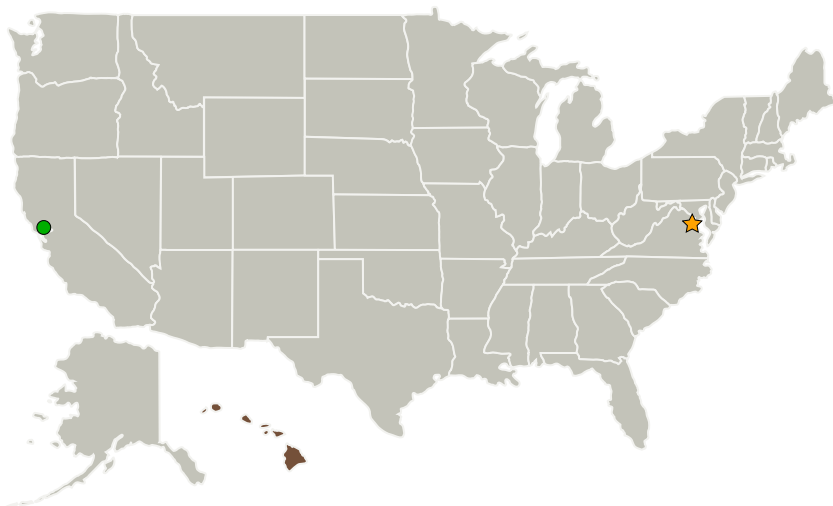
Completed Technology Project (2014 - 2017)



## Project Introduction

This project will demonstrate how hyperspectral thermal infrared (TIR; 8-14 microns) image data, with a spectral resolution of up to 8 wavenumbers, can be acquired by an instrument of sufficiently low mass, volume, and power consumption that it could be cost effectively deployed on small- or micro-satellites. This would constitute a new earth science measurement as there are currently no operational hyperspectral sensors acquiring TIR data with the spatial resolution needed to perform imaging spectroscopy for earth science applications, although these are many (mineral exploration; wildfire characterization; volcanic hazards; soil moisture/drought characterization). The University of Hawaii has developed a breadboard that uses uncooled microbolometers and a Fabry-Perot interferometer to acquire image cubes of 52 TIR spectral bands. This project will mature this technology towards spaceborne deployment. The proposed work involves, 1) optimizing the optical and mechanical design and calibration system; 2) incorporating new microbolometers with surface coatings that increase sensitivity and flatten responsiveness between 8-14 microns, 3) conducting a system level characterization of the instrument using NIST-traceable standards (SNR, spectral and spatial resolution, saturation radiances, radiometric linearity/response; 4) producing integrated instrument control and interferometric processing software; and 5) demonstrating science data collection from an airborne platform. The spatial resolution of the proposed microbolometer-based instrument would be  $\sim 120$  m from an orbit of 480 km. Performance period is 36 months. Entry TRL is 4 and exit TRL is 6.

## Primary U.S. Work Locations and Key Partners



ALHAT - ETD Autonomous  
Landing & Hazard Avoidance  
Tech Earth Science Technology  
Office

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Organizations Performing Work	Role	Type	Location
★ NASA Headquarters(HQ)	Lead Organization	NASA Center	Washington, District of Columbia
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
University of Hawaii at Manoa	Supporting Organization	Academia Asian American Native American Pacific Islander (AANAPISI)	Honolulu, Hawaii

## Primary U.S. Work Locations

Hawaii

## Images



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ALHAT - ETD Autonomous Landing & Hazard Avoidance Tech Earth Science Technology Office  
(<https://techport.nasa.gov/image/5136>)

## Organizational Responsibility

### Responsible Mission Directorate:

Science Mission Directorate (SMD)

### Lead Center / Facility:

NASA Headquarters (HQ)

### Responsible Program:

Instrument Incubator

## Project Management

### Program Director:

Pamela S Millar

### Program Manager:

Parminder S Ghuman

### Principal Investigator:

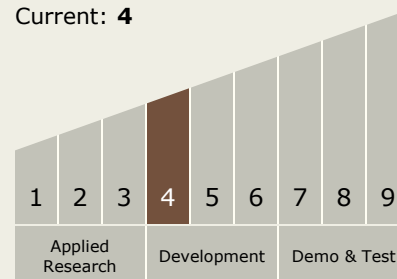
Robert B Wright

### Co-Investigator:

Kathleen S Yoshinaga

## Technology Maturity (TRL)

Start: 4  
Current: 4



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## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.3 Optical Components

## Target Destination

Earth